STATE OF MINNESOTA
PUBLIC UTILITIES COMMISSION

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J. Dennis O'Brien	Commissioner
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Betsy Wergin	Commissioner

In the Matter of the Application of Lakefield Wind Project, LLC for a a Site Permit for a 205.5-Megawatt Large Wind Energy Conversion System and Associated Facilities in Jackson County	**ISSUE DATE:** **DOCKET NO.** IP-6829/WS-09-1239 **FINDINGS OF FACT, CONCLUSIONS OF LAW AND ORDER, ISSUING A SITE PERMIT TO LAKEFIELD WIND PROJECT, LLC FOR THE LAKEFIELD WIND**

The above-entitled matter came before the Minnesota Public Utilities Commission (Commission) pursuant to an application submitted by Lakefield Wind Project, LLC for a site permit to construct, operate, maintain and manage a 205.5-Megawatt (MW) nameplate capacity Large Wind Energy Conversion System (LWECS), including associated facilities, in Jackson County.

All of the proposed wind turbines and associated facilities will be located in Jackson County. Associated facilities will include pad mounted step-up transformers for each wind turbine, access roads, an electrical collection system, project substation, and up to two permanent meteorological towers. The energy from the proposed 205.5 MW project will be delivered from the project substation to the electrical grid at the existing Lakefield Junction Substation located just east of Lakefield, Minnesota.

STATEMENT OF ISSUE

Should Lakefield Wind Project, LLC be granted a site permit under Minnesota Statutes section 216F.04 to construct a 205.5 MW Large Wind Energy Conversion System and associated facilities in Jackson County?

Based upon the record created in this proceeding, the Public Utilities Commission makes the following findings:

FINDINGS OF FACT

Background and Procedure

1. On November 4, 2010, Lakefield Wind Project, LLC (Lakefield Wind or Lakefield), a subsidiary of enXco Development Corporation (eDC), filed a site permit application with the Public Utilities Commission for up to 205.5 megawatts (MW) of nameplate wind power generating capacity and associated facilities identified as the Lakefield Wind Project in Jackson County (Exhibit 1, p. 1).

2. Office of Energy Security (OES) Energy Facility Permitting (EFP) staff reviewed and determined that the November 4, 2010, application complied with the application requirements of Minnesota Rules 7854.0500. In its comments and recommendations to the Commission, dated December 17, 2009, OES EFP staff recommended that the Commission accept the application (Exhibit 2).

3. On December 21, 2009, a Commission Order accepted Lakefield's application for the Lakefield Wind Project and associated facilities (Exhibit 3).

4. On December 28, 2009, OES EFP staff posted "Notice of Application Acceptance" on the Commission's web site and eDockets (Exhibit 4).

5. On December 22, 2009, the applicant distributed copies of the site permit application and notice of application acceptance to government agencies and site residents (Exhibits 4 & 5). The notice and application distribution met the requirements of Minnesota Rules 7854.0600, subparts 2 and 3.

6. Published notice of site permit application acceptance and opportunity to comment on the application completeness and issues to consider in the development of a Draft Site Permit appeared in the *Lakefield Standard* on December 31, 2009 (Exhibit 6). The published notice provided: a) a description of the proposed project; b) deadline for public comments on the application; c) description of the site permit review process and d) identification of the Public Advisor. Notice also appeared on the Commission's web site on December 28, 2009. The notice published meets the requirements of Minnesota Rule 7854.0600, subpart 2.

7. Public Comments on the completeness of the site permit application were accepted until January 27, 2009. OES EFP staff received one (1) public comment from the Department of Natural Resources on the site permit application (Exhibit 7). Lakefield Wind also submitted a document titled: *Ecological Risk Assessment: Rare Species, Birds, Bats, Wetlands and Managed Lands,* prepared for the project by Westwood (Exhibit 8).

DNR's letter and the *Ecological Risk Assessment* were summarized in the OES Comments and Recommendations presented to the Commission at its March 4, 2010, meeting in conjunction with the OES EFP recommendation for issuance of a "Draft Site Permit" for the Lakefield Wind Project (Exhibit 9).

8. On March 9, 2010, a Commission Order made a preliminary determination that a "Draft Site Permit" may be issued for the Lakefield Wind Project (Exhibit 10). The Commission Order took no action on the DNR proposed exclusion areas, (Exhibit7) and directed "The Applicant to work with EFP and DNR staff to identify and conduct studies to assess the need for exclusion area and avian and bat specific permit conditions."

9. On March 15, 2010, OES EFP staff issued a "Notice of Public Information and Scoping Meeting" for the Lakefield Wind Farm. This notice was posted on eDockets on March 18, 2010, and posted on the Commission's web site on March 8, 2010 (Exhibit 11).

10. On March 19, 2010, Lakefield Wind mailed copies of the "Notice of Public Information and Scoping Meeting" to governmental agencies and residents in the vicinity of the project (Exhibit 12). Notice of the Public Information and Scoping meeting was published in the *Lakefield Standard* on March 22, 2010 (Exhibit 13). On March 22, 2010, OES EFP staff published in the *EQB Monitor,* notice of the April 8, 2010, public information and scoping meeting, and opportunity to comment on the draft site permit, Volume 34, No. 6 (Exhibit 14, pages 6-9). The published notice contained all of the information required by Minnesota Rules part 7854.0900 subp. 1, and was distributed in accordance with the requirements of Minnesota Rules part 7854.0900 subp. 2.

11. The OES EFP staff held a public information and scoping meeting in the city of Lakefield on April 8, 2010, at 7:00 p.m., to provide an overview of the Commission permitting process and to receive comments on issues to be included the scope of the environmental report required for the certificate of need proceeding and on the preliminary draft site permit. Approximately 80 people attended the information and scoping meeting. Representatives from the Lakefield Wind were also present. OES EFP staff provided an overview LWECS site permitting process, reviewed the proposed site permit conditions and sought comments on issues to be included in the scoping decision for the environmental report. OES EFP staff and Lakefield Wind responded to project specific questions and general questions about wind energy. Questions were asked about project status, timing, setbacks from homes and roads, and taxes. See record of meeting record for all comments, questions and answers (Exhibit 15). The deadline for submitting comments on the site permit application and draft site permit was April 29, 2010.

12. On July 1, 2010, OES EFP staff issued a "Notice of Public Hearing and Availability of Environmental Report" for the Lakefield Wind Project. This notice was posted on eDockets on July 1, 2010, and posted on the Commission's web site on July 2, 2010 (Exhibit 16).

13. On July 2, 2010, Lakefield Wind mailed copies of the "Notice of Public Hearing and Availability of Environmental Report" to governmental agencies and residents in the vicinity of the project (Exhibit 17). "Notice of Public Hearing and Availability of Environmental Report" was published in the *Lakefield Standard* on July 8, 2010 (Exhibit 18).

14. A public hearing on Lakefield Wind Project was held on July 19, 2010, and presided over by Richard Luis from the Office of Administrative Hearings. Approximately 20 people attended the public hearing. No significant issues were raised at the hearing. On August 30, 2010, Administrative Law Judge Richard Luis filed his "Summary of Public Testimony" (Exhibit 19). A court reporter prepared a record of the public hearing (Exhibit 20).

Permittee

15. Lakefield Wind Project, LLC (Lakefield Wind or Applicant), is a subsidiary enXco Development Corporation (eDC or enXco). Lakefield Wind Project, LLC and its member eDC, will own and oversee the engineering, procurement and construction of the project. The operator of the Lakefield Wind Project will be enXco Service Corporation (eSC) (Exhibit 1, p.1).

16. Lakefield Wind entered into a 20-year Power Purchase Agreement (PPA) with Indianapolis Power & Light Company (IPL) on June 29, 2009 (Exhibit 1, p. 2).

Interconnection Agreement

17. The Lakefield Wind Project is in the Midwest Independent System Operator (MISO) Queue No. G164. Lakefield Wind executed a Large Generator Interconnection Agreement (LGIA) on September 13, 2005, with MISO and the Interstate Power and Light Company. The agreement was suspended on November 2, 2005. Subsequently the Interstate transmission system was acquired by the International Transmission Company (ITC) and the LGIA was assigned to them (Exhibit 1, p. 2).

Project Description

18. The Lakefield Wind Project involves construction of up to 137 GE 1.5 MW wind turbine generators, transformers, electrical collection system, project substation, a short (less than 1,500 feet) 345 kV transmission line extending from the project substation to the Lakefield Junction Substation, supervisory control and data acquisition (SCADA) system, access roads, and two permanent meteorological towers (Exhibit 1, p 10). The Project's turbine locations (which include alternate locations) are shown on Exhibit 22. Existing buildings in the city of Lakefield will be used for the Operations and Maintenance facility.

19. The turbine towers will be 80 meters (262.5 feet) in height. The rotor diameter will be 77 meters (252.6 feet). The blades on the GE 1.5 MW turbines are approximately 125 feet long. Total height of the tower and blade (12 o'clock position) will be 118.5 meters

(388.8 feet). The rotor diameter will have a swept area of 4,654 square meters (50,095 square feet). The rotor speed varies from 11.1 to 20.2 revolutions per minute corresponding to a maximum rotor tip speed of approximately 185 miles per hour (Exhibit 1, page 11).

20. The General Electric (GE) 1.5 MW wind turbine is a three bladed, upwind, active yaw, and active aerodynamic control regulated wind turbine with power/torque control capabilities. The rotor utilizes blade pitch regulation and variable speed operation to achieve optimum power output at all wind speeds. The variable speed operation minimizes power and torque spike delivered from the rotor to the drive train resulting in improved long-term reliability. Each turbine is equipped with a wind direction sensor. The wind direction sensor communicates with the computer system, which evaluates the measured wind parameters, and within a specified time interval, activates the yaw drives to align the nacelle to the wind direction (Exhibit 1, p. 12 through 15).

21. Housed inside the fiberglass nacelle that sits on the top of the tower are the generator, brake system, yaw drive system and other miscellaneous components (Exhibit 1, p. 14).

22. The blades are made of fiberglass with a smooth layer of gel coat that provides ultraviolet protection. The blades will be either white or grey in color. The blades will be equipped with lightning protection. The entire turbine is also grounded and shielded to protect against lightning (Exhibit 1, p. 12).

23. Each tower will be secured by a concrete foundation that will vary in size depending on the soil conditions. Due to the wide array spacing of the turbines, an investigation of the soil strengths and characteristics will be performed at each turbine site for optimization of the foundation designs for the Project (Exhibit 1, p. 15). A control panel that houses communication and electronic circuitry is placed in each tower. In addition, a step-up, pad-mounted transformer is necessary for each turbine to collect the power from the turbine and transfer it to a 34.5 kV collection system via underground cables.

24. Each turbine is interconnected through an underground electrical collection system at 34.5 kV. The feeder lines of the project collection system feed the power to the independent breaker positions at the proposed project substation. The project substation steps up the voltage from the 34.5 kV collection systems to the transmission system level. All of the proposed collector/feeder lines would connect to the proposed project substation within the site permit boundaries (Exhibit 1, p. 16-17).

25. All turbines and up to two permanent meteorological towers will be interconnected with fiber optic communication cable that will be installed underground. The communication cables will run back to a central host computer which will be located either at the project substation or at the operations and maintenance facility where a supervisory control and data acquisition (SCADA) system will be located. Signals from transformers at each of the delivery points will also be fed to the central SCADA host computer. The SCADA system will be able to give status indications of the individual wind turbines and the substation and allow for remote control of the wind turbines locally or from a remote

computer. This computerized SCADA network will provide detailed operating and performance information for each wind turbine. The Permittee will maintain a computer program and database for tracking each wind turbines maintenance history and energy production (Exhibit 1, p. 21).

26. Each turbine will be accessible by a low profile gravel road extending from the turbine base to a public road. The roads will be all weather gravel construction and approximately 15 to 20 feet wide. To facilitate crane movement and equipment delivery, additional temporary, gravel roadways will be installed on either side of the permanent roadway. Temporary roads will be approximately 40 to 45 feet wide (Exhibit 1, p. 15).

27. Because of its size, the Project will require an Operations and Maintenance (O & M) facility to maintain the turbines and associated facilities. Lakefield Wind is investigating the purchase of two existing buildings in Lakefield to serve as the Operation and Maintenance headquarters for the Lakefield Project. The two buildings total approximately 19,300 square feet (Exhibit 1, p. 16).

28. Lakefield Wind will permit the project substation and associated 345 kV high voltage transmission line to the point of interconnection (POI) through Jackson County. Because the 345 kV high voltage transmission line will not exceed 1,500 feet in length, a route permit from the Commission is not required (Exhibit 1, p 17).

Site Location, Topography and Characteristics

29. The 205.5 MW Lakefield Wind Project, will be located in central Jackson County, several miles west of the city of Jackson and just to the east, north and south of the city of Lakefield on agricultural lands for which Lakefield Wind has obtained the wind rights in Des Moines (sections 5-8, 17-20), Hunter (sections 1-5, 8-17, 20-29), Belmont (sections 19, 30-31), and Heron Lake (14-17, 19-29, 33-36) townships. These townships are zoned agricultural. The topography within the site is gently undulating. Elevations in the Project Area range from 1,540 feet above mean sea level in the southeastern portion of the site to 1,401 feet near South Lake Heron. The dominant land use is agricultural, comprised of corn, soybeans, forage land (hay), wheat, and silage corn. Lands within the Project boundaries are also used for livestock production (hogs, chickens, cattle). There are also numerous windbreaks within the proposed site boundaries, typically around farmsteads. The Project boundary encompasses approximately 32,445 acres. Lakefield Wind has wind rights on approximately 19,000 acres of private lands within the 32,445 acre Project boundary (Exhibit 1, p. 3 and 25).

30. Construction of the turbines sites and access roads will involve temporarily disturbing at the most approximately five to ten acres of land per turbine or approximately 685 to 1,370 acres for contractor staging areas, foundation construction, underground power lines, and tower and turbine assembly. The Lakefield Wind Project will require construction of 30 miles of turbine access roads. These all weather gravel roads are built to Class 5 standards, similar to township and are expected to be about 15 to 20 feet wide. The permanent displacement for turbine access roads and for towers and transformers and areas around them is about 150 acres for the Lakefield Wind Project.

31. Wind turbine and access roads are sited to take into account the contours of the land and prime farmland locations to minimize impact. The Project will be subject to the requirements of the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Construction Stormwater Permit. An erosion and sediment control plan and Storm Water Pollution Prevention Plan (SWPPP) will also be prepared for the Project and the disturbed areas will be seeded after construction to stabilize the area.

Wind Resource Considerations

32. Wind monitoring data in the Project Area indicate that the long-term mean annual 80-meter wind speeds across Jackson County average from 8.1 to 8.5 meters per second (mps) (18.1 to 19 mph). Wind speeds are generally greater in the night and early morning hours and decline at midday. The lowest wind speeds are in mid-morning and early evening. Regionally, the prevailing wind directions are generally south/southwest and west northwest. Of the annual energy budget, a higher percentage results from southerly winds, which are most frequent in the warmer weather months. The northerly winds typically occur in winter (Exhibit 1, p 3-9).

33. For this project, turbines will be sited in short strings or clusters on higher ground within the site boundaries. The wind turbines are sited so as to have good exposure to winds from all directions with emphasis on exposure to the prevailing southerly and northwesterly wind directions. The turbine spacing, according to Lakefield's application, maximizes use of the available wind and minimizes wake and array losses within the topographical context of the site. The turbines are typically oriented west-southwest to north-northeast, which is roughly perpendicular to the prevailing southerly and northwest winds. Turbine placement, aside from other resource features where setbacks or wind access buffers are required, will be designed to provide sufficient spacing between the turbines to minimize internal wake losses. Given the prevalence for southerly and northerly winds, the spacing is widest in the north-south direction. Greater or lesser spacing between the turbines or turbine strings may be used in areas where the terrain dictates the spacing. This is addressed in the permit at II.E.5. In some instances, individual turbine sites may also be used to minimize Project impacts. Sufficient spacing between the turbines is utilized to minimize wake losses when the winds are blowing parallel to the turbines.

34. The net annual energy production from the project, assuming various losses aggregating to roughly 16 percent, is estimated at approximately 750,000 MWh (Megawatt hours) or approximately 5,475 MWh per turbine (Exhibit 1, p 24). The base energy calculation presented assumes a normal or average wind year. The maximum variation in energy is within +/- 15 percent. Based on the data, the annual variation in energy at the project site is expected to be within 10 percent of the mean during most years.

Land Rights and Easement Agreements

35. In order to build a wind plant, a developer needs to secure site leases and easement option agreements to ensure access to the site for construction and operation of a proposed project. These lease or easement agreements also prohibit landowners from any activities that might interfere with the execution of the proposed project (Exhibit 1, p. 10).

36. Lakefield Wind has obtained lease and easement option agreements, or rights to such agreements with 204 landowners controlling 250 parcels of land totaling approximately 19,000 acres of land within the project site boundary (Exhibit 1, p. 10).

37. Within the project boundary these 19,000 acres will be used by Lakefield Wind to provide for wind and buffer easements, wind turbines, access roads, meteorological towers, electrical collection system and electric lines located on or along public road rights-of-way. If necessary, additional wind rights will be acquired to comply with site permit setback requirements (Exhibit 1, p. 10).

Site Considerations

38. Minnesota Statutes chapter 216F and Minnesota Rules chapter 7854 apply to the siting of Large Wind Energy Conversion Systems (LWECS). The rules require an applicant to provide a substantial amount of information to allow the Commission to determine the potential environmental and human impacts of the proposed project and whether the project is compatible with environmental preservation, sustainable development, and the efficient use of resources. Pursuant to Minnesota Statutes section 216F.02, certain sections in Minnesota Statutes chapter 216E (Minnesota Power Plant Siting Act) apply to siting LWECS, including 216E.03, subd. 7. [Considerations in designating site and routes.] The analysis of the environmental impacts required by Minnesota Rule 7854.0500, subpart 7, satisfies the environmental review requirements; no environmental assessment worksheet or environmental impact statement is required for a proposed LWECS project. Therefore, environmental review is based on the application and the record of this proceeding. The following findings address the considerations relevant to a LWECS project.

Human Settlement

39. The site is in an area of relatively low population density, characteristic of rural areas throughout southwestern Minnesota. Within the Project Area boundary there are approximately 3 to 4 farmsteads/homes/residences per square mile. The population of the four townships (Des Moines, Hunter, Belmont and Heron Lake) is 1,110 which represent a population density of about 8 persons per square mile according to 2008 data. Per Capita Income within the townships varies from 14,380 to 21,496 (Exhibit 1, p. 26). Lakefield Wind's final site plan indicates that the minimum distance between any turbine and any homes or residences is approximately 1,250 feet, irrespective of whether that landowner is a participating or a non-participating landowner. See Site Permit II.A.2. Lakefield Wind will also be required to set back its turbines a minimum of five rotor diameters (1,260 feet) on the prevailing wind axis from non-participating landowner's

property lines and three rotor diameters (756 feet) on the non-prevailing wind axis. The impact of the proposed LWECS on human settlement will be minimal. The site permit part II.A.2.and 3 has conditions for setbacks from residences and roads. The proposed wind turbine layout will meet or exceed those requirements. The proposed project is not expected to affect any water wells (used, unused or unsealed) or any rural water system that services the area (Exhibit 1, p. 26-28).

40. There will be no displacement of existing residences or structures in siting the wind turbines and associated facilities.

Community Benefits

41. In addition to creating jobs (approximately 10 full time positions) and personal income, potentially lowering property taxes and improving infrastructure, the Project will pay an energy production tax to the local units of government (Jackson County and the townships of Des Moines, Hunter, Belmont and Heron Lake) of 0.0012 cent per kWh of electricity produced, resulting in an annual wind energy production tax of approximately $900,000. Indirect economic benefits include creation of new jobs in manufacturing, operations and technology (Exhibit 1, p. 27). Landowners with turbine(s) and/or wind easements on their property will also receive payments from the Permittee.

42. To the extent that local workers and local contractors are capable, qualified, and available, the Permittee will seek to hire them to construct the proposed project. The hiring of local people will expand employment opportunities in this area of the state and keep money in the local economy. Once constructed, the project will be staffed with several site technicians and a wind plant supervisor (Exhibit 1, p. 27).

Noise

43. Lakefield Wind has taken possible noise impacts to nearby rural residences/ farmsteads and other potentially affected into account in the design and siting of turbines for the Lakefield Wind Project. Background noise levels in the Project Area are typical of those in a rural setting, where existing nighttime noise levels are commonly in the low to mid-30 dBA. The dBA scale represents A-weighted decibels based on the range of human hearing. Higher levels exist near roads and other areas of human activity (Exhibit 1, p. 28-29). Wind turbines, when in motion, do generate sound or noise. The level of sound (noise) varies with the speed of the turbine, the distance of the listener or receptor from the turbine and surface characteristics of the site. Operation and maintenance of the wind turbines and associated facilities will create increased noise levels. However, increases in noise levels within the Project Area are expected to be minimal due to the noise levels produced by the wind itself, especially at the setback distance the turbines will be from homes, approximately 1,250 feet (Exhibit 1, p. 28-29).

44. Lakefield Wind evaluated the sound power level (Lp) information provided by the manufacturer of the GE 1.5 MW wind turbine to assess representative noise levels for the Project. According to the manufacturer's noise data, the sound power level of the GE 1.5MW xle wind turbine at a 10 meter height for an 80 meter hub height ranges from less than 96 dB (at 3 m/s wind speed) to less than or equal to 104.0 dB (at 9 m/s wind speed to

the cut out speed. The highest sound power level of 104.0 dB in addition to a 2 dB margin of error was used to calculate the distance to the noise setback. The 106 dBA sound power level was converted to the sound pressure level and compared to the Minnesota Pollution Control Agency Nighttime L50 limit of 50 dBA for NAC 1, the most stringent limit. The distance to the 50 dBA noise setback is (827 feet) 252 meters. Lakefield Wind has incorporated setbacks of at least 1,250 feet (378 meters) from residences to stay below the MPCA Nighttime Noise Limit of 50 dBA. The noise setback is based upon the calculated distance to the 50 dBA noise level for the highest noise output associated with the wind turbine selected for this Project, plus an additional setback distance as a safety factor to account for GIS-based mapping accuracy (Exhibit 1, p. 29-31). A Wind Turbine Noise Analysis for the Lakefield Wind Project, dated March 3, 2010, prepared by Wind Energy Consulting and Contracting, Inc., evaluated the project noise levels at 218 residences within the site. Noise levels varied from 25.2 to 48.7 dB (A) (Exhibit 28). Noise levels were calculated using the WindPRO 2.6/2.7 wind project modeling software package.

45. Noise impacts to nearby residents and other potentially affected parties have been factored into the turbine micrositing process. Lakefield Wind will comply with MPCA noise standards. See permit condition III.B.3.

Shadow Flicker

46. The issue of shadow flicker was raised by Mark Handrus during the public comment period. Lakefield Wind did consider the potential impact of shadow flicker. Shadow flicker is described as a moving shadow on the ground resulting in alternating changes in light intensity. Shadow flicker computer models simulate the path of the sun over the year and assess at regular time intervals the possible shadow flicker across a project area. The outputs of the model are useful in the design phase of a wind farm. Shadow flicker usually occurs in the morning and evening hours when the sun is low in the horizon and the shadows are elongated. Shadow flicker does not occur when the turbine rotor is oriented parallel to the receptor or when the turbine is not operating. In addition, no shadow flicker will be present when the sun seen from a receptor is obscured by clouds, or by other obstacles already casting a shadow such as buildings and trees.

47. Shadow intensity, or how “light” or “dark” a shadow appears at a specific receptor, will vary with the distance from the turbine. Closer to a turbine, the blades will block out a larger portion of the sun’s rays and shadows will be wider and darker. Receptors located farther away from a turbine will experience much thinner and less distinct shadows since the blades will not block out as much sunlight. Shadow flicker will be greatly reduced or eliminated within a residence when buildings, trees, blinds, or curtains are located between the turbine and receptor. Shadow flicker consultants generally agree that flicker is not noticeable beyond about 10 rotor diameters from a wind turbine. Evidence of shadow flicker effects is hard to find, which indicates it is more of a nuisance issue. Minnesota has no published standards for shadow flicker and no examples of turbines causing photosensitivity related problems. A few jurisdictions in other countries have established guidelines for acceptable levels of shadow flicker based on certain assumptions.

48. A Wind Turbine Shadow Flicker Analysis for the Lakefield Wind Project, dated March July 12, 2010, was prepared by Wind Energy Consulting and Contracting, Inc., to calculate shadow flicker exposure for the 218 homes/residences in the project footprint. Of the 218 residences, it was calculated that 59 of the residences would have more than 30 hours of shadow flicker per year or more than 30 minutes per day, which is a worst case scenario. Of those 59 homes, nine will have more than 100 hours of shadow flicker per year. The shadow flicker levels at each residence are identified in terms of hours per year, days per year, and the maximum duration of shadow on the worst day (Exhibit 29, Table 3). For residences that have more than 30 hours of shadow flicker per year or more than 30 minutes on the worst day, a graphical calendar has been generated (one for each residence). The graphical calendars show at what time of the day and year the shadow could fall on the residence) (Exhibit 29, Appendix). The site permit does not contain shadow flicker limits.

Visual Values

49. The placement of up to 137 turbines for the Lakefield Wind Project will affect the appearance of the area. The wind turbines will be mounted on tubular towers that are 262.5 feet tall. The rotor blades will have a diameter of 252.5 feet. The turbine towers and rotor blades will be prominent features on the landscape. There will be intermittent, expansive views of the turbines to passing motorists on highways I-90, Trunk Highway 86 and County Sate Aid Highways 24, 12, 16, 14, 17, and 34, County Road 70 and local roads. Motorists and drivers on township and county roads may travel within 300 feet of some turbines (Exhibit 1, p. 31-33).

50. The visual impact of the wind turbines will be reduced by the use of a neutral paint color. The only lights will be those required by the Federal Aviation Administration. All site permits issued by the Commission require the use of tubular towers; therefore, the turbine towers will be uniform in appearance. Blades used in the proposed project will be white or grey. The wind turbines in this project, while prominent on the landscape, also blend in with the surrounding area. The project site will retain its rural character. The turbines and associated facilities necessary to harvest the wind for energy are not inconsistent with existing agricultural practices in the project area (Exhibit 1, p. 31-33).

51. From one perspective, the proposed project might be perceived as a visual intrusion on the natural aesthetic value on the landscape, characterized by up to 134 tubular steel structures approximately 262.5 feet high, standing on agricultural land, with 126.5 foot long blades, for an overall height of 389 feet or more when one blade is in the vertical position. Wind plants have their own aesthetic quality, distinguishing them from other non-agricultural uses. Existing wind plants have altered the landscape elsewhere in Minnesota from agricultural to wind plant/agricultural. This project will modify the visual character of the area. Because wind generation development is likely to continue in Jackson County, this visual presence will continue to increase as wind development occurs. To date, the presence of the wind turbines in other parts of Minnesota has been well accepted by the people who live and work in those areas.

52. Visually, the Lakefield Wind Project will be similar to other LWECS projects located in Jackson County and the counties that border Jackson County.

Human Health and Safety

53. Lakefield Wind has prepared an aeronautical study. The purpose of the aeronautical study is to determine what effect the proposal may have on compliance with Airports Programs, the safe and efficient utilization of the navigable airspace by aircraft, and the safety of persons and property on the ground. A complete study consists of an airspace analysis, a flight safety review, and a review of the Project's potential effect on air traffic control operations and air navigation facilities. A preliminary evaluation determined that: a) there are no anticipated impacts to Air Defense and Homeland Security radars within the proposed development; and b) there is minimal to no impact to Weather Surveillance Radar -1988 Doppler (WSR-88D) weather radar operations (Exhibit 27).

54. The study reviews the Project against aviation and airspace criteria set for in Federal Aviation Regulation (FAR) Part 77 (14 Code of Federal Regulations 77) Objects Affecting the Navigable Airspace; FAA Order 8260.3B, the United States Standard for Terminal Instrument Procedures (TERPs) and Federal Aviation Administration (FAA) Order JO 7400.2G, Procedures For Handling Airspace Matters. The criteria in these documents comprise the factors the FAA uses in evaluating the aeronautical compatibility of the project when submitted for FAA Review (Exhibit 27).

55. FAA review through its airports division, coordinates review with the Air Force, which also represents the Army and Navy, and includes coordination and review with: a) the service area office which is responsible for evaluating the proposal from the standpoint of safe and efficient use of airspace by aircraft; b) the flight procedures office which is responsible for evaluating proposals to determine impacts on instrument procedures and whether aircraft instrument operation can be conducted safely; c) the flight standards division which is responsible for reviewing proposal to determine the safety of aeronautical operations, and of persons and property on the ground; d) the flight standards district office which is responsible for seaplane bases and heliports; and e) and the technical operations services area office which is responsible for reviewing engineering studies on airport proposals to evaluate their effects upon commissioned and/or proposed navigation aids, electromagnetic studies to evaluate the project on air navigation and communication facilities, reviewing and evaluating line-of-site (shadow) studies to determine impact on control tower visibility and frequency management problems and reserving frequencies (Exhibit 27).

56. On February 2010, the Federal Aviation Administration notified the project proposer that an aeronautical study under the provisions of 49 United States Code, Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, determined that the 137 turbines, three alternative turbine locations and the two permanent Met tower sites do not exceed obstruction standards and that they would not be a hazard to air navigation provided that the structure is marked and/or lighted in accordance with FAA Advisory circular 70/7460-1 K Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights-Chapter 4,12 & 13 (Turbines) (Exhibit 27).

57. There are two registered airports and one heliport located within approximately 10 miles of the Project Area. A review of the AirNav, LLC (AirNav 2009) database identified seven registered airports within 20 miles of the center of the Project Area; however, the nearest airport is six miles west-southwest of the Project. In addition to the registered airports, there is one unregistered private airstrip in the Project Area approximately one mile north of Lakefield (Reder Airfield). A second unregistered landing strip is located east of Okabena and approximately 6 miles west of the northwestern project boundary (Exhibit 1, p. 48-50).

58. The Project is not expected to create significant impact on air traffic in the region. There are no registered airports located within the project boundary and all registered airports and helipads are at least three to five miles away from the project boundary, with most registered airports being at least five to 10 miles away from the project. Although aviation impacts are not anticipated, Lakefield Wind will coordinate with the registered airports to ensure that the proposed wind turbines will not cause disruptions or use of dangerous operating procedures (Exhibit 1, p. 49-50). Lakefield Wind will coordinate with the independent owner of the Reder Airfield, located one mile north of Lakefield, to ensure that turbines are not placed in locations that would be a detriment or danger to continued use of the airfield for small aircraft. Lakefield Wind will also coordinate with the owner of the small landing strip located near Okabena to ensure that they are aware of the project and the location of the turbines (Exhibit 1, p. 49-50).

59. The addition of 137 turbines in active croplands and the two permanent free standing meteorological towers increase the potential for collisions with crop-dusting aircraft. The turbines would be visible from a distance and lighted according to FAA requirements. The two permanent meteorological towers will be free standing and have lighting consistent with the turbines. Crop-dusting operations are conducted during daylight hours and usually by local pilots with knowledge of the area (Exhibit 1, p. 48-50). The Minnesota Aeronautical Chart produced by the Minnesota Department of Transportation is available and shows wind turbine locations throughout the state. This chart is updated annually and will include the Lakefield Wind Project after construction is complete. This chart is available at www.mndot.gov. Lakefield Wind will notify local airports, aerial applicators, and hospitals regarding the Met towers and turbines to reduce the risk to crop dusters, emergency helicopters, and other local aircraft (Exhibit 1, p. 53).

60. Possible health effects associated with wind turbines and transmission of electricity generally include those from electric and magnetic fields (EMF). The term EMF refers to electric and magnetic fields that are present around electrical devices. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, power collection (feeder) lines, substation transformers, house wiring and electrical appliances. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors (transmission line wire). Once energized, the proposed Project will generate electromagnetic fields (Exhibit 1, p. 48-49).

61. While there is no conclusive research evidence that EMFs from power line and wind turbines pose a significant health impact; the turbines will be installed no closer than 1,250 feet from occupied residences, where EMF is expected to be at background levels. Based on the most current research on EMFs, and the distance between any turbines or collector lines and occupied homes, the proposed Project is not anticipated to have significant impact to public health and safety due to EMFs (Exhibit 1, p. 51).

62. Wind turbines constructed as part of the Project will be registered with the Jackson County Emergency Management Department and Lakefield Wind will work with the County EMD to develop appropriate response procedures for response to emergencies, natural hazards, hazardous materials incidents, manmade problems (e.g. fire) and related incidents concerning the Project. Lakefield Wind will also work with the County Planning Office for assignment of 911 addresses for coordination of emergency response. Project construction and operation is expected to have little impact on the security and safety of local residents. As with any large construction project, some risk of worker or public injury exists during construction. Lakefield Wind and its construction representatives and workers will prepare and implement work plans and specifications in accordance with applicable worker safety requirements during construction of the Project. Lakefield Wind will also control public access to the Project during construction and operation. Lakefield Wind will provide security during construction and operation of the project, including fencing, warning signs, and locks on equipment and facilities. The Permittee will also provide landowners, interested persons and public officials and emergency responders with safety information about the project and its facilities. See site permit conditions III.B.15 and 16.

63. In winter months ice may accumulate on the wind turbine blades when the turbines are stopped or operating very slowly. Furthermore, the anemometer may ice up at the same time, causing the turbine to shut down during any icing event. As weather conditions change, any ice will normally drop off the blades in relatively small pieces before the turbines resume operation. This is due to flexing of the blades and the blades' smooth surface. Although turbine icing is an infrequent event, it remains important that the turbines are not sited in areas where regular human activity is expected below the turbines during the winter months. The turbine setbacks from residences and roads will minimize impacts from ice throw. See site permit conditions II.A.2 and 3.

64. Each turbine will be clearly labeled to identify each unit and a map of the site with the labeling system will be provided to local authorities as part of the emergency response requirement. See permit condition III.B.16 and 17.

Public Services and Infrastructure

65. There are three natural gas pipelines within or near the Project Area (see Exhibit 1, exh.6). A six-inch buried natural gas pipeline runs east-west through the Project Area south of and parallel to CSAH 34. From that pipeline two smaller pipelines (two and three inches in diameter) run north to the city of Lakefield parallel to State Trunk Highway 86. Another six-inch buried natural gas pipeline runs adjacent to the eastern boundary of the Project Area. The project is not expected to impact the pipelines.

Lakefield Wind will coordinate with the owners of the pipelines to minimize any potential for impacts on the pipelines (Exhibit 1, p. 34).

66. Presently there are five electric utility transmission lines and one substation within the Project Area. The Lakefield Junction Substation is located approximately 0.5 mile east of the city of Lakefield along 460th Avenue approximately 0.25 mile south of CSAH 14. A Mid-American Energy Company 345 kV transmission line runs through the Project Area from the southwest corner to the Lakefield Junction Substation. A Northern States Power Company 345 kV transmission line bisects the Project Area from west to northeast, running through the Lakefield Junction Substation and the TOE Wildlife Management Area. ITC Midwest has 161 kV transmission lines that run north, east and generally southwest from the Lakefield Junction Substation. ITC also has a 69 kV transmission line that runs west from the Lakefield Junction Substation to the city of Lakefield and then turns north through the northwestern portion of the Project Area. A map of the existing electric transmission lines is in the site permit application (Exhibit 1, p. 34 and Exh. 6). The Project is not expected to impact or affect the existing transmission line.

67. Red Rock Rural Water is the water utility for the townships. RRRW has a water tower located within the Project Area, as well as water distribution lines that provide water to parts of the Project Area, while other homes and farmsteads have on-site water wells, as verified by the county well index. Homes and farmsteads typically utilize on-site septic systems for individual sanitary needs (Exhibit 1, p 35). The Project is not expected to impact rural water lines, wells and septic system.

68. Existing roadway infrastructure in and around the Project Area consists of state, county and township roads that generally follow section lines, with private unpaved farmstead driveways and farming access roads. The primary transportation arteries through the Project Area include I-90, Trunk Highway 86 and County Sate Aid Highways 24, 12, 16, 14, 17, 34, County Road 70 and local roads. According to MnDOT the average daily traffic (ADT) for I-90 within the study area is 7,600 vehicles. The ADT for TH 86 located on the west side varies from 1,450 to 2,800 vehicles per day. Other roads within the site average 70 to 890 vehicles per day (Exhibit 1, p. 35 and Exh. 7 in site permit application).

69. The project will require the use of public roads to deliver construction supplies and materials to the work site. Equipment and materials used in the erection of wind farms are extremely heavy and do cause road damage. Weight related impacts to roads include physical damage to the structure of the road itself and/or damage to culverts and bridges (Exhibit 1, p. 37). The site permit at III.B.8, addresses road damages.

70. Lakefield Wind will work with all parties involved to address concerns related to roadway use, and adhere to state, county and township requirements for transportation infrastructure. OES EFP discussions with the Jackson County Highway Engineer (Tim Stahl) and Lakefield Wind, indicate that Jackson County and enXco Development will enter into a comprehensive Development Agreement, which includes a Road Use and Repair Agreement and a Public Drainage System Protection Agreement. The agreement

specifies the commitments made by County and the Developer for the purpose of ensuring that the Project is consistent with the existing Policies and Ordinances of Jackson County to the extent they are not superseded or preempted by the LWECS Permit, and to ensure that all final permit approvals will be in the best interests of the citizens of Jackson County.

71. Prior to construction Lakefield Wind will coordinate with the applicable local and state entities to ensure that the weights being introduced to area roads are acceptable. Lakefield Wind will work with the cities of Lakefield and Jackson; Belmont, Heron Lake, Des Moines and Hunter townships; Jackson County; and MnDOT regarding roadway concerns, right-of-way work (if any), setbacks, access and permitting oversize loads during construction of the Project. Lakefield Wind has worked closely with the landowners in the placement of access roads to minimize land-use disruptions during construction and operation of the Project to the extent possible (Exhibit 1, p. 39-40).

72. Lakefield Wind contracted Evans and Associates to complete a microwave search interference study on existing non-Federal Government microwave telecommunication systems, including digital television broadcast systems. The study identified eight unique microwave paths, 26 land mobile radio facilities, five digital TV stations and 14 FM stations within the search area (within two miles of the project boundary). Land mobile facilities are wireless communication systems intended for use by users in vehicles, such as those used by emergency first responder organizations, public works organization, or companies with large vehicle fleets of numerous field staff (Exhibit 1, p. 36).

73. Prior to construction, Gopher State One Call will be contacted to locate underground facilities so they can be avoided. To the extent Project facilities cross or otherwise affect existing telephone lines or equipment, Lakefield Wind will make arrangements with applicable service providers to avoid interference with such facilities. At this time, no impacts are anticipated to microwave or radio. The telecommunications study performed by Evans and Associates identifies possible mitigation methods for TV interference. The extent of mitigation measures necessary will depend upon the final turbine layout. Lakefield Wind will not operate the wind farm so as to cause microwave, radio, telephone, television or navigation interference contrary to FCC regulations or other applicable law. If operation of the Project causes such interference, Lake Wind will take the steps necessary to correct the problem (Exhibit 1, p. 40). See permit condition III.C.4.

74. The proposed project will have approximately 56 miles of underground cables for the electrical collector lines on private property within the wind farm. The underground cables will be installed in a trench that is at least 48 inches in depth. However, some of these underground circuits will cross public rights-of-way. Lakefield Wind's application indicates that the underground cable layout will be completed in a manner that meets affected landowner requirements, minimizes impact to the environment and achieves required economics. Above ground cable vaults measuring 48 inches by 60 inches will be installed where underground cable circuits intersect. The vaults will be installed in a manner to minimize visual impact, avoid interference with intended land use, and ensure the public is protected. Where appropriate, posts will be installed adjacent to the

underground cable vaults to minimize damage by farm equipment or vehicles. Cable circuits will be installed underneath public rights-of-way in compliance with road permits received from appropriate public authorities. Placement of collector and feeder lines is addressed in the site permit at II.B.7 and 8. The proposed wind farm is expected to have a minimal effect on the existing infrastructure.

75. Construction of the project requires the addition of approximately 31 miles of access roads that will be located on private property. Turbine access roads will be located adjacent to fence lines, and field edges to minimize disturbance to agricultural activities where possible. The typical access road will be 15 to 20 feet in width and covered in Class 5 gravel (or similar material). The access roads will be low profile roads to allow for the movement of agricultural equipment. The site permit at III.B. 8 (b) addresses this topic. During operation and maintenance of the wind plant, operation and maintenance crews, while inspecting and servicing the wind turbines, will use access roads. Periodic grading and maintenance activities will be used to maintain road integrity. The Permittee may do this work or contract it out.

76. If access roads are installed across streams or drainage ways, the Permittee in consultation with the Minnesota Department of Natural Resources (DNR) will design, shape and locate the road so as not to alter the original water flow or drainage patterns. Any work required below the ordinary high water line, such as road crossings or culvert installation, will require a permit from the DNR. See site permit at IV.E.

77. Construction, operation, and maintenance of the proposed wind plant will comply with all of the required federal and state permit requirements. See site permit at IV.E.

Recreational Resources

78. Information from the US. Fish & Wildlife Service (USFWS), Minnesota Department of Natural Resources (DNR), and Jackson County were reviewed to identify recreation resources within and near the Project Area. Significant recreational resources identified within this portion of Jackson County include the Des Moines River, Kilen Woods State Park, DNR Scientific and Natural Areas (SNAs), multiple Wildlife Management Areas (WMAs) and Wildlife Production Areas (WPAs), several County parks, Nature Conservancy Land, and recreational lakes and trails. These features are illustrated in the site permit application (Exhibit 1, p. 44 and as shown on Exh. 9 of the site permit application). Lakefield Wind believes they have designed the Project in a way that will avoid direct impacts to recreational resources within the Project Area.

79. Recreational resources within the project area include five Wildlife Management Areas (WMAs). All other identified recreational resources are outside of the existing project boundary where physical land disturbance is not planned. Lakefield Wind has indicted that they will not locate turbines within five rotor diameters of the WMAs within the site permit boundary (Exhibit 1, p. 47). Impacts to recreational resources will be visual in nature, and will affect individuals utilizing public open spaces within approximately 4 miles of the project vicinity. No scenic vistas located along the Des Moines Valley are expected to be impacted. The top of the bluff along most of the river in this area is

predominately forested, including areas adjacent to Kilen Woods State Park (Exhibit 1, p. 47). Turbine operations are not expected to directly affect the natural areas in any material way.

Effects on Land-Based Economies

80. The proposed Project will permanently impact some cropland and pastureland, approximately up to 150 acres, for construction of wind turbine structures, access roads and associated infrastructure. Construction activities associated with the Project (e.g. grading, soil compaction, access roads, turn around areas, and temporary construction staging areas) will also temporarily impact agricultural lands. Overall, impact to agricultural lands as a result of the Project is anticipated to be short term, and is not expected to alter crop production. Once in operation, it may be occasionally necessary for Lakefield Wind to complete repairs, or clear vegetation around a turbine or facility, which could result in additional temporary impacts to agricultural operations. These interruptions are expected to be infrequent and short term (Exhibit 1, p. 56-58).

81. Lakefield Wind has reviewed turbine locations and access road locations with landowners to identify features on their property, including drain tile and other encumbrances that should be avoided. Potential project construction encumbrances were detailed by the landowners upon the initial wind easement or land lease agreement, which will be marked by Lakefield Wind prior to construction. The only land that will be taken permanently out of production will be those areas encumbered by turbines, access roads, and supporting infrastructure. Additional farmland may be temporarily impacted for use during construction as staging and access areas (Exhibit 1, p. 59).

82. Soil compaction is a temporary impact. The construction equipment used in the erection of wind turbines, much like agricultural equipment, is designed with wide tires and tracks to distribute weight over a larger area. This minimizes the degree of soil compaction resulting from construction. In areas where excessive soil compaction has occurred, Lakefield Wind will work with the landowner and negotiate appropriate corrective measures, such as tilling, chiseling, or other methods (Exhibit 1, p. 59).

83. Drain tiles may be damaged or cut as a result of installing underground cable and tower foundations. To minimize damage to drain tiles, they will be avoided where possible, if their location is known. Lakefield Wind will development and implement a drain tile mitigation plan. The plan will address steps that will be taken to avoid, repair or replace drain tile that may be impacted by the Project (Exhibit 1, p. 59).

84. Impacts on agricultural crops, livestock, native vegetation, and landscaped areas are anticipated to be minimal. Landowners will be reimbursed for potential damage incurred to crops, livestock, and property in a manner consistent with the terms of the lease or easement agreement. Once the Project is completed, Lakefield Wind will restore vegetation within disturbed areas as close as practicable to its original condition. Sites used for temporary storage, material staging, and access areas typically experience significant amounts of traffic; these sites will likely require tilling prior to seeding to loosen compacted soils (Exhibit 1, p. 59).

85. Lakefield Wind will avoid impacts to Reinvest in Minnesota (RIM) land, and will minimize impacts to Conservation Reserve Program (CRP) land to the extent possible. If CRP land is impacted, Lakefield Wind will work with the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS), as well as the landowner to remove the impacted portion of the parcel from the CRP program (Exhibit 1, p. 59).

86. The site permit at III.B. 2., 3., 4., 5., 6., 7., 8(c)., 9., and 10. addresses mitigation measures for agricultural lands.

87. The proposed project does not adversely affect any sand or gravel operations, nor will it impact forestry.

Archaeological and Historical Resources

88. Lakefield Wind conducted a review of records at the Minnesota State Historic Preservation Office (SHPO) and Office of the State Archaeologist (OSA) for the Project Area and a two mile buffer around the Project Area. The background literature search identified 67 historic architectural properties located within two miles of the proposed Project Area. Of the 67 properties, only three are located with the Project boundary. There are two archaeological sites located within the Project Area. One is identified as an artifact scatter and the other as lithic scatter. A Phase I Archaeology survey was recommended and completed (December 21, 2009) and recently updated (August 25, 2010) for all the proposed wind turbine locations, access roads, junction boxes and areas of construction impact to document previously unrecorded archaeological sites within the project area (Exhibit 31). A letter from the State Historic Preservation Office on March 2, 2010, to David Weetman, Westwood Professional Services stated: "We have reviewed the results of the survey for the project area. Based on the results of this survey, we feel that the probability of any unreported properties being located in the area of potential effect is low (Exhibit 31).

89. A Phase I survey provides enough information to allow consideration of avoidance if a site is to be impacted by an undertaking and to gather enough information to allow for reasonable recommendations for more detailed work should it be necessary.

90. When archaeological sites are found during a Phase I survey, their integrity and significance is addressed in terms of the site's potential eligibility for placement on the National Register of Historic Places (NRHP). If such sites are found to be eligible for the NRHP, appropriate mitigative measures will be developed in consultation with the Minnesota State Historic Preservation Officer (SHPO), the State Archaeologist, and consulting American Indian communities. The site permit (III.C.3) requires the Permittee to stop work and notify the Minnesota Historical Society and Commission if any unrecorded cultural resources are found during construction.

Air and Water Emissions

91. No harmful air or water emissions are expected from the construction and operation of the LWECS.

Animals and Wildlife

92. The majority of the project area (88 percent) is used for agriculture, primarily row cropping, with some hay and pasture lands. Five Wildlife Management Areas (WMAs) are within the project boundary and an additional eight have been identified adjacent to or within 4 miles of the project boundary. Non-agricultural lands that provide wildlife habitat near the project include the Des Moines River, Kilen Woods State Park, Scientific and Natural Areas, county parks, Wildlife Production Areas, and The Nature Conservancy lands (Exhibit 1, 44-47). The project will have direct and indirect impacts on birds, bats, and other wildlife resources and their habitats. Direct impacts may include strike fatality from turbine blades, power lines, and related infrastructure. Indirect impacts may include displacement of birds and bats and other wildlife from their habitats, site avoidance, and behavioral modification (National Wind Coordinating Committee, Spring 2010).

93. The United States Fish and Wildlife Service (USFWS) have developed Draft Guidelines for Wind Turbine Siting (2010) in collaboration with the Wind Turbine Guidelines Advisory Committee. The Guidelines are intended to provide wind developers and regulatory agencies with the information needed to identify, assess, and monitor the potentially adverse impacts of wind energy projects on wildlife and their habitats, particularly migratory birds and bats. The guidelines focus on a tiered approach to gathering information on a site and potential risks to wildlife and wildlife habitat. Depending on the results obtained from each tier, pre-and/or post-construction survey work is indicated along with associated mitigative measures.

94. Recent studies indicate a broad range in avian and bat fatalities across the United States as a result of wind development, with the highest fatalities occurring in the eastern United States. In the Midwest, post-construction studies completed in Iowa, Minnesota, and Wisconsin confirm a wide range of fatality rates. The highest bird and bat fatalities were found at the 145 MW Blue Sky Green Field wind facility in Wisconsin, with bird fatalities at 12 birds/turbine/year and bat fatalities at 40 bats/turbine /year (Gruver et al. 2009). Fatalities range from 1 to 4 birds/turbine/year and from 1 to 8 bats/turbine/year across most of the upper Midwest. Avian and bat studies conducted at the Buffalo Ridge, Minnesota (Johnson et al 2000), found an average of 1-4 bird fatalities/turbine/year and 1-3 bat fatalities/turbine/yr. Projects in areas with similar habitat and cover types would likely have similar fatality rates, depending on migration patterns, known resting and foraging areas, and potential for bat hibernacula. However, as wind facilities and turbines increase and move into areas or landscapes where migration or use patterns are less understood, it becomes increasingly difficult to make landscape level comparisons between facilities and predict the impacts on avian and bat populations.

95. Lakefield Wind, LLC completed an Ecological Risk Assessment (October 2009) consisting of a desktop study and a three day field review of the project area in August 2009 (Exhibit 7). The assessment satisfies Tiers 1 and 2 of the USFWS Draft Guidelines for Wind Turbine Siting. Some of the major findings from the Ecological Risk Assessment are:

    a. The assessment provides a master bird list of occurrence for the Lakefield project area compiled by the Minnesota Ornithologist's Union County Checklist for Jackson County. Uncommon or rare species are not included on the list as there is a low probability they could occur in the project area. The assessment identified 193 bird species. Species on the list represent both migrants and breeding birds. The most species rich-orders on the list are songbirds (92 species), shorebirds (32 species), and waterfowl (23 species). The project area lies within the Mississippi Flyway, one of four major migration corridors in North America. It is likely that migrating birds use the surrounding lakes and wetlands as migratory stopover habitat. Locally, the Des Moines River may be a regional migration corridor within the larger Mississippi Flyway.
    b. Twenty-nine of the species on the Lakefield bird list are considered Watch List Species (those most in need of conservation) or Stewardship Species (those that merit special planning and responsibility because a high proportion of their population inhabits a single characteristic landscape for breeding, wintering, or both). Together, the Watch List and Stewardship Species represent the landbirds of greatest continental importance for conservation action.
    c. One federally threatened bird species (Piping Plover) is known to Jackson County and is also a state-listed endangered species. There are 4 state-listed species known to occur within the project area and 10 species of special concern.
    d. Five of the seven bat species known to occur in Minnesota have a high potential to occur within the project area. Of these, 3 species roost primarily in trees, one in man-made structures, and one in both. It is likely bats use the wetlands and other water resources in the project area for foraging, as well as the riparian corridor along the Des Moines River. Farmsteads, including outbuildings and trees, provide habitat within the project area.
    e. There is a lack of data on habitat use in the project area by birds during the spring and fall for migration stopovers.
    f. There are approximately 520 acres of wetlands within the project area according to National Wetlands Inventory. Wetlands identified within the project area during the site visit were observed to be primarily Types 1 (seasonally flooded) and 2 (wet meadows) and most showed signs of partial drainage.
    g. There are approximately 2,700 acres of federal Waterfowl Production Areas and 2,300 acres of state Wildlife Management within and near the project area. Of these, approximately 1,100 acres are within or adjacent to the project boundary. Another 1,000 acres within or adjacent to the project area are private conservation lands or lands enrolled in conservation easement programs such as Reinvest in Minnesota (RIM) or the federal Conservation Reserve Program (CRP).
    h. The eastern edge of the project area is within 1.5 miles of the Des Moines River.

i. Avian and bat fatalities are expected to be similar to fatalities in the Buffalo Ridge, Minnesota, studies. Bird Fatalities are expected to be approximately 3 birds/turbine/year or 4birds/MW/yr. Bat fatalities would be approximately 1 to 3 bats/turbine/yr.

96. The MDNR comments from January 27, 2010 (Exhibit8), note that the project area is considered to be a high risk site due to the numerous public lands within and adjacent to the project area. Additionally, South Heron Lake, which extends into the project area near the northwest boundary, is in the process of being nominated as an Important Birding Area by the Audubon Society. This designation recognizes sites that provide essential habitat for one or more breeding, wintering, or migrating species of bird.

97. Comments and Recommendations by OES Staff for the Draft Site Permit (February 25, 2010) (Exhibit 9), recommended the Applicant work with OES and MDNR to identify and conduct studies to assess the need for exclusion areas and avian and bat specific permit conditions.

98. Meetings with USFWS, MDNR, and OES were held March 17 and 30, 2010, to discuss avian study protocols. On April 5, 2010, MDNR and USFWS provided revised recommendations for pre-construction biological surveys for birds and bats. On April 20, 2010, OES provided applicants with Final Bird Survey Protocol for flight path studies and breeding bird surveys and noted that (1) the need for fall bird surveys would be assessed based on the findings of spring bird survey work and (2) bat survey methods still needed to be resolved and noted recommended survey dates provided by MDNR and USFWS (Exhibit 21).

99. Pre-Construction Avian surveys were conducted from May 10-June 16, 2010, to assess the risk of avian impacts at the proposed project location (Exhibit 22). The objectives of the study were to: (1) characterize flight patterns near select proposed turbine locations to identify local flight paths between Boot Lake and South Heron Lake, (2) evaluate the diversity of breeding birds at select turbine locations within the proposed project area, and (3) determine the presence/absence of threatened, endangered, and species of special concern. Conclusions of the survey are:

a. There is no flight path corridor through the project area between Boot Lake and South Heron Lake for waterbirds.
b. 30.8 percent of flying waterbirds were observed within the rotor swept height (RSH) for at least part of their flight. Most of this percentage (56 of 96 birds) involved a single observation of a flock of Canada Geese.
c. Breeding bird species diversity is not significantly higher at proposed turbines closer to water resources and wildlife lands than at distant turbines.
d. No federally listed species were observed. One of 10 state-listed special concern species, the American White Pelican, was observed flying in the project vicinity. This species was likely travelling from its colony at Big Twin Lake in Martin County (17 miles east of the project area) to forage. MDNR indicates pelican foraging ranges could extend 31 miles from their nesting colony.

e. The Upland Sandpiper, a species of interest to MDNR but with no state conservation status, was observed in the project area and showed indications of nesting in the vicinity of proposed turbine 59.
f. Westwood observed 58 avian species migrating and/or breeding in the project area.
g. Generally, observed species are common and or abundant in both occurrence and distribution in an agricultural landscape.
h. For all birds in flight (n=1,211), 21.7 percent of birds were within the RSH for at least part of the flight. When considering the proportion of migration season that overlapped with the survey period, (i.e. weeks 1-3), 24 percent of all birds observed in flight (n=600) were within the RSH for part or all of their flight.
i. Turbines are all proposed to be sited in agricultural land and an adequate distance from water features and wildlife lands that likely harbor a higher diversity of birds due to better quality habitat.
j. Consistent with the Ecological Risk Assessment completed in October 2009, the risk of the Lakefield Wind Project is expected to be low.

100. Bird data from the Ecological Risk Assessment indicate a higher number of observed bird species in Jackson County than the field surveys completed in the late spring/early summer of 2010. This may indicate that either the survey work missed the migrating bird season due to the late start date, or that fewer bird species utilize the project area due to unsuitable habitat. Additional survey work during the migratory period may resolve this uncertainty.

101. MDNR provided applicants with bat monitoring protocol and potential locations on the site for conducting such surveys on April 5, 2010. The protocol suggested conducting acoustic bat surveys using widely available and accepted equipment and practices. Acoustic bat surveys using Anabat recorders were recommended from July 1, 2010-September 30, 2010, to coincide with bat migration.

102. Acoustic bat monitoring and bat fatality monitoring are most effectively conducted concurrently, as done at the Buffalo Ridge and the Blue Sky Green Field facilities. Bat fatalities and bat activity are not always correlated, indicating a need for acoustic activity to be verified with fatality monitoring at turbines. Bat surveys can be productively conducted from April 1-May 31, June 1-August 1, and July 15-October 31.

103. On August 6, 2010, MDNR sent a comment letter to Judge Luis. Of particular note is concern over the lack or bat survey work and the possibility that spring bird surveys missed the majority of bird migration due to the May 10 start date. This concern was also raised in the April 20, 2010, Final Bird Survey Protocol. (Exhibits 23 and 24).

104. On behalf of the Applicant, Westwood Professional Services sent a letter to OES responding to the issue of pre-construction bat surveys. The Applicant does not think pre-construction bat survey work is necessary because of the five bat species found in the project area, none are federal or state listed species. Additionally, due to the agricultural nature of the landscape, the Applicant believes there is little suitable bat habitat, and that

bat fatalities are likely to be similar to those of Buffalo Ridge (2 bats/turbine/year) due to the relative proximity of the projects (40 miles) (Exhibit 26).

105. Although the project will be sited in land currently used for agriculture, the surrounding lands within and adjacent to the project boundary are known to provide valuable wildlife habitat. This wildlife habitat and potential bird and bat populations could alter expected fatality rates. Post-construction fatality monitoring can verify whether or not fatality rates are similar to those found at Buffalo Ridge.

106. Curtailment (increase in cut-in speed) of turbines has been found to be a cost-effective mitigation strategy for significantly reducing bat fatalities at the Casselman Wind Project in Pennsylvania.

Vegetation

107. The Project Area lies within a portion of the state that was historically covered predominately with upland prairie and prairie wetland, with small amounts of oak woodland and brushland. However, with the exception of steep slopes and drainages, nearly all of the native vegetation in the Project Area has been converted to agriculture (Exhibit 1, p. 70). The National Land Cover Dataset indicates that the vast majority of the Project Area consists of agricultural land. About 87.7 percent of the Project Area is mapped as Agriculture on the NLCD, 6.4 percent Developed land (Farmstead and Roads), 2.5 percent Grasslands, 1.1 percent Forestland, 1.5 percent wetland, 0.4percent Open Water and 0.2 percent Scrubland (Exhibit 1, p. 71). Vegetation within the Project Area consists mainly of agricultural crops including predominately corn and soybeans with smaller amounts of wheat, alfalfa and hay.

108. No impacts to native vegetation are anticipated as a result of the proposed Lakefield Wind Project. Proposed turbine locations are all on agricultural land. Access roads will be sited and connected to public roads without crossing through any woodlands, grasslands or wetlands. It is anticipated that collector/feeder lines and transmission lines will avoid these resources also (Exhibit 1, p. 71). No public waters, wetlands or forested lands are expected to be adversely affected by the project. No groves of trees or shelterbelts will need to be removed to construct and operate the system. Native prairie, if present, will also be avoided. If native prairie cannot be avoided, the site permit, at III. C.6. provides for preparation of a prairie protection and management plan.

Soils

109. The Project Area is mapped as Delft-Clarion Association. According to the Soil Survey of Jackson County, this association is characterized by nearly level to hilly, well drained and poorly drained, loamy soils that formed in glacial till on uplands (Exhibit 1, p. 62). Construction of the wind turbines, associated facilities, access roads and collector/feeder lines will require grading in farmland increasing the potential for erosion during construction. Construction activities on highly erodible soils will be avoided (Exhibit 1, p. 65).

110. Lakefield Wind will obtain a National Pollutant Discharge Eliminations System (NPDES) permit from the Minnesota Pollution Control Agency (MPCA) to discharge storm water from construction activities. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared and submitted to the MPCA at the time the NPDES permit application is submitted. Appropriate Best Management Practices (BMPs) will be used during construction and operation of the project to protect topsoil and to minimize soil erosion. Typical BMPs include: (1) encompassing excavated material and disturbed soil with silt fence and/or bio-rolls; (2) protecting exposed soil with temporary seed mixes or hydro-mulches; (3) covering slopes with erosion control blankets and mulches, and (4) restoring disturbed areas as soon as practicable (Exhibit 1, p. 65). The site permit at (III. B. 9.) requires a soil erosion and sediment control plan and a storm water run-off permit from the Minnesota Pollution Control Agency.

Surface Water, Floodplain Resources and Wetlands

111. Several watercourse systems are mapped within the Project Area and appear to be a mix of natural streams and judicial drainage ditches. There are no designated trout streams within the site boundary. The National Wetland Inventory (NWI) Mapping indicates there are 529 acres of wetland within the Project Area, representing approximately 1.6 percent of the Project Area (Exhibit1, p. 67).

112. Turbines will be located on topographically elevated uplands, and are not expected to affect streams, surface water bodies or floodplains. The Project Area is served by an extensive network of state, county and township roads, which will provide site access and egress. Based on the proposed site layout, no impacts to streams, wetlands, floodplains, or shorelands are anticipated. Lakefield Wind will coordinate with the St. Paul District of the U.S. Army Corps of Engineers, and the Jackson Soil and Water Conservation District (SWCD) to obtain concurrence that stream and surface water body impacts are being avoided. Jackson SWCD is the Local Government Unit responsible for administering the Minnesota Wetland Conservation Act in this area, and the St. Paul District of the U.S. Army Corps of Engineers administers Section 404 of the Federal Clean Water Act. If wetlands cannot be avoided, the appropriate permits will be obtained (Exhibit 1, p. 67).

113. The installation of underground utilities using vibratory plow and directional bore methods do not require a permit unless there is the need to excavate or backfill at the location of connecting points (Exhibit 1, p. 70).

Future Development and Expansion

114. Current information suggests windy areas in this part of the state are large enough to accommodate more wind facilities. In the future, wind turbines used in Jackson and surrounding counties will consist of several types and sizes supplied by different vendors and installed at different times.

115. While large-scale projects have occurred elsewhere (Texas, Iowa and California), little systematic study of the cumulative impact has occurred. Research on the total impact of many different projects in one area has not occurred. OES EFP staff continues to monitor for impacts and issues related to wind energy development.

116. The Commission anticipates more site permit applications under Minnesota Statutes section 216F.04 (a). The Commission is responsible for siting of LWECS "in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources." Minnesota Statutes section 216F.03.

117. Minnesota Statutes section 216E.03, subd. 7 require consideration of design options that might minimize adverse environmental impacts. By using larger turbines, fewer turbines are required, reducing siting needs for turbines and related facilities. Turbines must also be designed to minimize noise and aesthetic impacts. Buffers between strings of turbines are designed to protect the turbines' production potential. The site permit also provides for buffers between adjacent wind generation projects to protect production potential. See site permit at II.A.1.

Efficient Use of the Wind Resource

118. The location and spacing of the turbines are critical to the issues of orderly development and the efficient use of wind resources. Turbines are likely to be located in the best winds, and the spacing dictates, among other factors, how much land area the project occupies. There is strong public support for orderly development.

119. One efficiency issue is the loss of wind in the wake of turbines. When wind is converted to rotational energy by the blades of a wind turbine, energy is extracted from the wind. Consequently, the wind flow behind the turbine is not as fast and is more turbulent than the free-flowing wind. This condition persists for some distance behind the turbine as normal wind flow is gradually restored. If a turbine is spaced too close downwind of another, it produces less energy and is less cost-effective. This is the wake loss effect. If the spacing is too far, wind resources are wasted and the projects' footprint on the land is unnecessarily large.

120. For this project, turbine spacing maximizes use of the available wind resources and minimizes wake and array losses within the topographical context of the site. Site topography, natural resource features and wind resources did lead to a layout involving isolated turbine placement or short strings of turbines running perpendicular to the prevailing wind. The objective is to capture the most net energy possible from the best available wind resource. Allowing for setbacks from roads and residences and avoiding sensitive areas, Lakefield Wind arrived at a nominal turbine spacing of 3 rotor diameters in the non-prevailing wind directions and five or more rotor diameters in the prevailing wind directions, northwest-southerly direction, with respect to the predominant energy production directions. Given the prevalence for southerly winds, the spacing between turbines will be greater in the prevailing winds in the northwest-southerly direction for the Lakefield Wind Project.

121. Other factors that lead to energy production discounts include turbine availability, blade soiling, icing, high wind hysteresis, cold weather shutdown, electrical efficiency and parasitic. Total losses typically range from 13 to 16 percent (Exhibit 1, p. 24).

Maintenance

122. Maintenance of the turbines will be on a scheduled, rotating basis with one or more units normally off for maintenance each day, if necessary. Maintenance on the interconnection points will be scheduled for low wind periods. The Lakefield Wind Project will be staffed with several wind technicians and a wind plant supervisor. An operations and maintenance facility will be located in the city of Lakefield.

Decommissioning and Restoration

123. The expected life of the Project will be 30 years and the Permittee reserves the right to re-apply for a LWECS site permit and continue operation of the Project. LWECS site permit renewal may be under a new long-term power purchase agreement (PPA), merchant operation of the Project, or replacement and re-powering of the Project.

124. Decommissioning activities will include (1) removal of all wind turbine components and towers; (2) removal of all pad mounted transformers; (3) removal of all above-ground distribution facilities; (4) removal of foundations; and (5) removal of surface road material and restoration of the roads and turbine sites to previous conditions to the extent feasible (Exhibit 1, p. 24-25). The Permit (III.E.1 and 2) requires the Permittee to submit a Decommissioning Plan to the Commission prior to commercial operation. The Permit (III.G.2.) addresses site restoration and paragraph III.G.3. addresses turbines abandoned prior to termination of operation of the LWECS.

Site Permit Conditions

125. All of the above findings pertain to the Applicant's requested permit for a 205.5 megawatt wind project.

126. Most of the conditions contained in this site permit were established as part of the site permit proceedings of other wind turbine projects permitted by the Environmental Quality Board and the Public Utilities Commission. Comments received by the Commission have been considered in development of the site permit. Permit language changes and additions that provide for clarification and supplemental conditions to the site permit conditions have been made consistent with these findings.

127. The site permit contains conditions that apply to site preparation, construction, cleanup, restoration, operation, maintenance, abandonment, decommissioning and all other aspects of the Project.

Based on the foregoing findings, the Minnesota Public Utilities Commission makes the following:

CONCLUSIONS OF LAW

1. Any of the foregoing findings which more properly should be designated as conclusions are hereby adopted as such.

2. The Minnesota Public Utilities Commission has jurisdiction under Minnesota Statute 216F.04 over the site permit applied for by Lakefield Wind Project, LLC for the 205.5 megawatt Lakefield Wind Project.

3. The application of Lakefield Wind Project, LLC for a site permit was properly filed and noticed as required by Minnesota Statutes 216F.04 and Minnesota Rules 7854.0600 subp. 2 and 7854.0900 subp 2.

4. The Minnesota Public Utilities Commission has afforded all interested persons an opportunity to participate in the development of the site permit and has complied with all applicable procedural requirements of Minnesota Statutes Chapter 216F and Minnesota Rules Chapter 7854.

5. The Minnesota Public Utilities Commission is the agency directed to carry out the legislative mandate to site LWECS in an orderly manner compatible with environmental preservation, sustainable development and the efficient use of resources. The proposed 205.5 megawatt LWECS Lakefield Wind Project will not create significant human or environmental impacts and is compatible with environmental preservation, sustainable development, and the efficient use of resources.

6. The Minnesota Public Utilities Commission has the authority under Minnesota Statutes section 216F.04 to establish conditions in site permits relating to site layout, construction and operation and maintenance of an LWECS. The conditions contained in the site permit issued to Lakefield Wind for the Lakefield Wind Project are appropriate and necessary and within the Minnesota Public Utilities Commission's authority.

7. In accordance with Minnesota Rule 7854.0500 subp.2. a site permit may not be issued until the certificate of need or other commitment requirement has been satisfied.

Based on the foregoing Findings of Fact and Conclusions of Law, the Minnesota Public Utilities Commission issues the following:

ORDER

A LWECS Site Permit is hereby issued to Lakefield Wind Project, LLC, to construct and operate the 205.5 megawatt Lakefield Wind Project and associated facilities in Jackson County in accordance with the conditions contained in the site permit and in compliance with the

requirements of Minnesota Statute 216F.04 and Minnesota Rules Chapter 7854 for PUC Docket No. IP-6829/WS-09-1239.

The site permit is attached hereto, with a map showing the approved site.

BY THE ORDER OF THE COMMISSION

_____
Burl W. Haar
Executive Secretary

(S E A L)

This document can be made available in alternative formats (i.e., large print or audio tape) by calling 651.297.4596 (Voice). Persons with hearing or speech disabilities may call us through Minnesota Relay at 1.800.627.3529 or by dialing 711.